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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/769,446	01/26/2001	Rajendra K. Shenoy	FON 103	3770

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EXAMINER
SHRIVASTAV, BRIJ B

ART UNIT	PAPER NUMBER
2862	

DATE MAILED: 01/15/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
09/769,446	Shenoy
Examiner	**Art Unit**
Brij Shrivastav	2862

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on Aug 24, 2001

2a) ☐ This action is **FINAL.** 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-26 is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideratio

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1-26 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☒ Notice of References Cited (PTO-892)

16) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)

17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 6

18) ☐ Interview Summary (PTO-413) Paper No(s). _____

19) ☐ Notice of Informal Patent Application (PTO-152)

20) ☐ Other:

DETAILED ACTION

Drawings

1. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-5 are rejected under 35 U.S.C. 102(b) as being anticipated by Liu et al (US 5,742,163).

Claim 1 is rejected as Liu et al teach an NMR imaging process and apparatus where an imaging object is subjected to an uniform magnetic field (figure 1A, numeral 14), and orthogonal magnetic field gradients (figure 1A, numeral 20; column 4, lines 9-13). Further, Liu et al apply RF energy to the imaging object according to a fast-spin echo technique (figures 2 and 7, shown as RF), and subsequently they also apply RF energy to the imaging object according to a driven equilibrium technique (figure 6; column 8, lines 9-19)

Claim 2 is rejected on the same basis as claim 1. Further, it is rejected as Liu et al teach detection of magnetic resonance signals emitted by the imaging object (figure 1A, numeral 38; column 4, lines 36-44).

Claim 3 is rejected on the same basis as claim 1. Further, it is rejected as Liu et al teach a fast-spin echo technique using multi-echo NMR imaging sequence (figures 6 and 8; column 8, lines 9-19 and 30-38).

Claims 4 and 5 are rejected on the same basis as claims 1 and 3. Further, they are rejected as Liu et al teach multi-echo NMR imaging sequence having a plurality of echoes (figure 6, numerals 62's) with each of the plurality of different echoes or at least one of the plurality of different echoes is coded differently (figure 6, numerals 56' and 64'; 64's are phase encoding blips).

3. Claims 11-18, 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Zur (US 4,893,081) .

Claim 11 is rejected as Zur teaches an NMR imaging process and system, where an imaging object is subjected to an uniform polarizing magnetic field (figure 4, numerals 82, 83, 84), and orthogonal magnetic field gradients (figure 4, numerals 85-88). Further, a 90 degree RF excitation pulse is applied (figure 3, numeral 51), followed by a sequence of 180 degree RF excitation pulses (figure 3, numerals 54, 62), which is followed by a second 90 degree excitation pulse (figure 3, numeral 54; column 5 and 6, lines 62-68, 1-9).

Claim 12 is rejected on the same basis as claim 11. Further, it is rejected as Zur teaches nuclear magnetic resonance signal detection (figure 4, numerals 94, 96), and processing to provide an image (figure 4, numerals 99, 101 and 102).

Claim 13 is rejected on the same basis as claim 11. Further, it is rejected as Zur teaches generation of spin echo by each of the 180 degree RF excitation pulses in the sequence (figure 1, numerals 14, 21 and 23, 26).

Claim 14 is rejected on the same basis as claims 11 and 13. Further, it is rejected as Zur teaches that each spin echo precedes a next 180 degree RF excitation pulse in the sequence (figure 1, numerals 14, 17 and 23, 21).

Claim 15 is rejected on the same basis as claims 11 and 13. Further, it is rejected as Zur teaches application of the second 90 degree RF excitation pulse is at the center of the spin echo generated by a last 180 degree RF excitation pulse in the sequence (figure 1, numerals 27, 26 and 23).

Claims 16 and 17 are rejected on the same basis as claims 11 and 13. Further, it is rejected as Zur teaches different encoding for each spin echo, or at least one spin echo is encoded differently than another spin echo (figures 1, 2, 3; column 5, lines 24-30).

Claim 18 is rejected on the same basis as claim 11. Further, it is rejected as Zur teaches a second 90 degree RF excitation pulse which has a phase such that magnetization of the imaging object is forced in the direction of the uniform polarizing magnetic field (figures 1, 2 ; columns 3 and 4, lines 67-68, 1-4).

Claim 24 is rejected on the same basis as claim 11 and 12. Further, it is rejected as Zur teaches first 90 degree excitation pulse which corresponds to the angular precession frequency for a selected plane of the imaging object (figure 3, column 5, lines 62-68).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 6-10 and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US 5,742,163), and further in view of Zur (US 4,893,081).

Claims 6 and 7 are rejected on the same basis as claims 1 and 3. Further, they are rejected as Zur teaches a 90 degree RF pulse at the center of a plurality of echoes, and it has a phase to force magnetization of the imaging object in the direction of the uniform polarizing magnetic field (figure 3, numeral 54). It would have been obvious for one with ordinary skill in the art to use driven equilibrium technique to improve signal to noise ratio.

Claims 8-10 are rejected on the same basis as claims 1 and 3. Further, they are rejected as Zur teaches multi-echo NMR imaging sequence having a first 90 degree RF pulse followed by a series of 180 degree RF pulses (figure 3, numerals 51, 54, 62) and 180 degree RF pulses include n 180 degree pulses which are followed by n echoes (figure 3, numerals 54, 62 and 68a, b), and a

second 90 degree RF pulse at a center of nth echo to orient magnetization of the imaging object in the direction of the uniform polarizing magnetic field (figure 3, numeral 54, second 90 degree RF pulse). It would have been obvious for one with ordinary skill in the art to use above stated pulse arrangement to shorten the time for imaging and improve signal to noise ratio for improve image quality.

Claim 19 is rejected on the same basis as claim 1. Further, it is rejected as Liu et al teach a human being as the imaging object (figure 1A, human face shown in area numeral 14). It would have been obvious for one with ordinary skill in the art to use an NMR imaging machine where the human being to be imaged can stand in the uniform magnetic field to improve comfort level of the person being imaged (recently such machines have been in use).

Claims 20-22 are rejected on the same basis as claims 1 and 2. Further, claim 20 is rejected as Liu et al teach fast spin echo technique to deliver RF energy pulse corresponding to the angular precession frequency for a selected plane of the imaging object (figure 7, numeral 52"). Claims 21 and 22 are rejected as for selecting a different plane of the object for imaging either the object has to be moved keeping the RF pulse with same angular precession frequency or with the object being stationary and RF pulse energy with different angular precession frequency. These are commonly used techniques to select different planes of an object for imaging, and one with ordinary skill in the art would have known and used them for imaging to improve quality.

5. Claims 23, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zur (US 4,893,081) .

Claim 23 is rejected on the same basis as claim 11. Further, it is rejected as Zur teaches a human being as the imaging object (figure 4, numeral 83). It would have been obvious for one with ordinary skill in the art to use an NMR imaging machine where the human being to be imaged can stand in the uniform magnetic field to improve comfort level of the person being imaged (recently such machines have been in use).

Claims 25, 26 are rejected on the same basis as claims 11, 12 and 24. Further, claims 25 and 26 are rejected as for selecting a different plane of the object for imaging either the object has to be moved keeping the RF pulse with same angular precession frequency or with the object being stationary and RF pulse energy with different angular precession frequency. These are commonly used techniques to select different planes of an object for imaging, and one with ordinary skill in the art would have known and used them for imaging to improve quality.

6. Any inquiry concerning this communication may be directed to Brij B. Shrivastav at telephone number 703-305-0649.

January 8, 2002

Brij B. Shrivastav